PATENT

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IN THE CLAIMS:

Please find below a listing of all of the pending claims. The statuses of the claims are set forth in parentheses.

1. (Original) A cooling system for cooling computer systems, the cooling system comprising:

temperature sensors operable to detect heat dissipated by the computer systems;

at least one circuit operable to compare an amount of heat being dissipated by the computer systems to a threshold associated with a maximum cooling capacity of the cooling system, wherein the at least one circuit is operable to place at least one electrical component of the computer systems in a lower-power state to reduce heat dissipation in response to the amount of heat being dissipated by the computer systems exceeding the threshold.

2. (Original) The cooling system of claim 1, wherein the lower-power state comprises reducing power consumption of one or more electrical components in the computer systems.

3. (Original) The cooling system of claim 1, wherein the lower-power state comprises shutting down one or more of the computer systems.

4. (Original) The cooling system of claim 1, wherein the maximum cooling capacity of the cooling system is based on a nominal heat dissipation of the computer systems, the nominal heat dissipation being less than a maximum heat dissipation of the computer systems.

5. (Original) The cooling system of claim 4, wherein the maximum cooling capacity of the cooling system is based on an aggregate of the nominal heat dissipation of each of the computer systems.

6. (Original) The cooling system of claim 1, wherein the cooling system is designed to cool electrical components of the computer systems based on a nominal heat dissipation of the electrical components, the nominal heat dissipation being less than a maximum heat dissipation of the electrical components.

7. (Original) The cooling system of claim 6, wherein the nominal heat dissipation is based on an average heat dissipation of the electrical components.

8. (Original) The cooling system of claim 1, further comprising cooling components distributing cooling fluid to the computer systems, wherein the at least one circuit controls the cooling components to distribute cooling fluid as a function of the heat dissipated by the computer systems.

9. (Original) The cooling system of claim 8, wherein an amount of cooling fluid distributed to at least one of the computer systems is substantially proportional to an amount of heat being dissipated by the at least one of the computer systems.

10. (Original) The cooling system of claim 8, wherein the cooling components comprise one or more of a valve, valve controller, blower, pump, louvers, actuated cells, and cooling plates.

11. (Original) The cooling system of claim 8, wherein the cooling fluid comprises at least one of air and liquid coolant.

12. (Original) The cooling system of claim 8, wherein the at least one circuit is operable to control at least one of valves and louvers to control air flow for cooling the computer systems based on the amount of heat being dissipated by the computer systems.

13. (Original) The cooling system of claim 8, wherein the at least one circuit is operable to control at least one of valves and a pump to distribute coolant for cooling the computer systems based on the amount of heat being dissipated by the computer systems.

14. (Original) The computer system of claim 1, further comprising cooling components distributing cooling fluid to the computer systems, wherein the at least one circuit controls the cooling components to distribute cooling fluid as a function of workload for the computer systems.

15. (Original) A method of cooling computer systems using a cooling system, the method comprising:

determining an amount of heat dissipated by the computer systems;

comparing the amount of heat being dissipated by the computer systems to a threshold associated with a maximum cooling capacity of the cooling system; and

placing at least one electrical component in the computer systems in a lower-power state to reduce heat dissipation in response to the amount of heat being dissipated exceeding the threshold.

16. (Original) The method of claim 15, wherein placing at least one electrical component in the computer systems in a lower-power state comprises reducing power consumption of one or more electrical components in one of the computer systems.

17. (Original) The method of claim 15, wherein placing at least one electrical component in the computer systems in a lower-power state comprises shutting down one or more of the computer systems.

18. (Original) The method of claim 15, wherein the maximum cooling capacity of the cooling system is based on a nominal heat dissipation of the computer systems, the nominal heat dissipation being less than a respective maximum heat dissipation of the computer systems.

19. (Original) The method of claim 15, wherein the maximum cooling capacity of the cooling system is based on an aggregate of the nominal heat dissipation of each of the computer systems.

20. (Original) The method of claim 15, further comprising distributing cooling fluid to the computer systems as a function of the heat dissipated by the computer systems.

21. (Original) The method of claim 20, wherein distributing cooling fluid further comprises distributing an amount of cooling fluid to each computer system, wherein the amount of cooling fluid is substantially proportional to an amount of heat being dissipated by a respective computer system.

22. (Original) The method of claim 21, wherein distributing cooling fluid further comprises controlling one or more of a valve, valve controller, blower, pump, louvers, and actuated cells to distribute cooling fluid as a function of heat dissipation.

23. (Original) The method of claim 15, further comprising distributing cooling fluid to the computer systems as a function of workload for the computer systems.

24. (Original) The method of claim 15, wherein placing at least one electrical component in the computer systems in a lower-power state comprises:

prioritizing applications running on the computer systems;

identifying one of the computer systems, wherein the identified computer system is running an application having a lower priority than another application running on another one of the computer systems; and

reducing power consumption of one or more electrical components in the identified computer system.

25. (Original) The method of claim 15, further comprising:

determining whether excess cooling resources are available for cooling the computer systems; and

placing the at least one electrical component in a higher-power state in response to the cooling system having excess cooling resources available.

26. (Original) The method of claim 25, wherein determining whether excess cooling resources are available comprises:

comparing an amount of cooling fluid being provided to cool the computer systems to a threshold; and

determining excess cooling resources are available in response to the amount of cooling fluid being less than the threshold.

27. (Original) The method of claim 26, wherein the threshold is associated with an amount of cooling fluid needed to cool heat dissipation less than the nominal heat dissipation of the computer systems.

28. (Original) The method of claim 15, further comprising redistributing cooling fluid to the computer systems based on the heat dissipation of each of the computer systems in response to the amount of heat being dissipated being less than the threshold.

29. (Original) A method of cooling computer systems based on heat dissipation comprising:

determining heat dissipated by the computer systems;

determining whether at least one of the computer systems needs more cooling fluid based on the heat dissipated by the at least one computer system;

in response to the at least one computer system needing more cooling fluid, performing steps of:

comparing the amount of heat being dissipated by the computer systems to a threshold associated with a maximum cooling capacity of the cooling system; and

distributing more cooling fluid to the at least one computer system in response to the amount of heat being dissipated by the computer systems being less than the threshold.

30. (Original) The method of claim 29, further comprising placing at least one component of the computer systems in a lower-power state to reduce heat dissipation in response to the amount of heat being dissipated by the computer systems exceeding the threshold.

31. (Original) The method of claim 29, further comprising distributing cooling fluid to the computer systems based on heat dissipated by the computer systems.

32. (Original) A method for designing a cooling system operable to cool multiple computers housed in an enclosure, the method comprising:

determining a nominal heat dissipation of the computer systems, the nominal heat dissipation being less than a maximum heat dissipation of the computer systems;

selecting components for the cooling system based on the nominal heat dissipation; and

deploying the cooling system to cool the computer systems.

33. (Original) The method of claim 32, wherein determining a nominal heat dissipation comprises determining an average heat dissipation of each computer system.

34. (Original) The method of claim 33, wherein determining an average heat dissipation of each computer system comprises determining an average heat dissipation of each computer system based on a substantially predetermined workload.

35. (Original) An apparatus for controlling cooling of computer systems comprising:

means for determining an amount of heat dissipated by the computer systems;

means for comparing the amount of heat being dissipated by the computer systems to a threshold associated with a maximum cooling capacity of the cooling system; and

means for placing at least one electrical component in the computer systems in a lower-power state to reduce heat dissipation in response to the amount of heat being dissipated exceeding the threshold.

36. (Original) The apparatus of claim 35, wherein the maximum cooling capacity of the cooling system is based on a nominal heat dissipation of the computer systems, the nominal heat dissipation being less than a respective maximum heat dissipation of the computer systems.

37. (Original) The apparatus of claim 35, further comprising means for distributing cooling fluid to the computer systems as a function of the heat dissipated by the computer systems.

38. (Original) The apparatus of claim 35, further comprising means for placing the at least one component in a higher-power state in response to excess cooling resources being available for cooling the computer systems.

39. (Original) The apparatus of claim 35, further comprising means for distributing cooling fluid to the computer systems as a function of workload for the computer systems.

40. (Original) A system comprising:

an enclosure housing multiple computer systems; and

a cooling system distributing cooling fluid to the multiple computer systems within the enclosure based on an amount of heat dissipated by the multiple computer systems, where the cooling system is designed based on nominal heat dissipation of the multiple computer systems, the nominal heat dissipation being less than a maximum heat dissipation of the multiple computer systems.

41. (Original) The system of claim 40, wherein the cooling system comprises heat sensors detecting heat dissipated by the multiple computer systems and cooling system components dynamically distributing cooling fluid to the multiple computer systems based on heat dissipation.

42. (Original) The system of claim 41, wherein the cooling system components comprise a blower sized based on the nominal heat dissipation of the multiple computer systems.

43. (Original) The system of claim 40, wherein the heat dissipated by at least one of the multiple computer systems is measured by temperatures sensors measuring cooling fluid temperature before the cooling fluid absorbs heat from the at least one computer system and measuring cooling fluid temperature after the cooling fluid absorbs heat dissipated by the at least one computer system.

44. (Original) The system of claim 43, wherein the temperature sensors are located substantially near a cooling fluid inlet to the at least one computer system and substantially near a cooling fluid outlets for the at least one computer system.

45. (Original) The system of claim 40, wherein an amount of cooling fluid distributed to at least one of the multiple computer systems is a function of the heat dissipation or input power for the at least one computer system and a change in temperature caused by the heat dissipation of the at least one computer system.

46. (Original) The system of claim 40, wherein the cooling system comprises at least one circuit operable to compare an amount of heat being dissipated by the multiple computer systems to a threshold associated with a maximum cooling capacity of the cooling system, wherein the at least one circuit is operable to place at least one electrical component of the multiple computer systems in a lower-power state to reduce heat dissipation in response to the amount of heat being dissipated by the multiple computer systems exceeding the threshold.